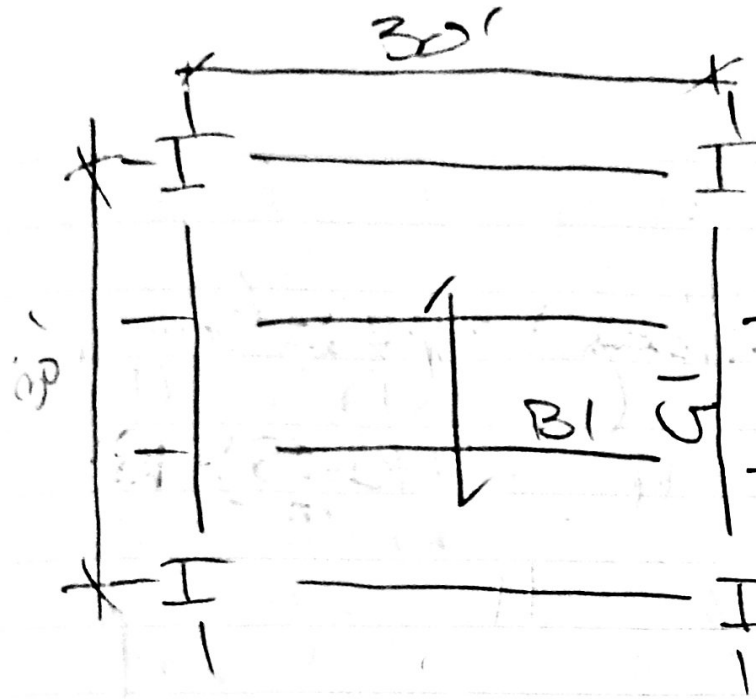
EXAMPLE 4



$$\text{PRE-COMPOSITE} = \left[\left(\frac{3'}{a}\right) + 3\tfrac{1}{4}\right]/12 \times 150\text{-GOPS}$$

$$= 60 + 8 = 68$$

$$M_{U\,PRE} = wl^2/8$$

$$W_U = 1.4 \times (10' \times 68_{PSF}) = 952\ \#/FT$$

$$1.2(10' \times 68) + 1.6(10' \times 20\ PSF) = 1136\ \#/FT$$

CONST LL

$$M_U = (1.14)(30)^2/8 = 128\ K\text{-}FT$$

TABLE 3-2: W14x26 IS SMALLEST W/ $\phi M_n > M_U$, BUT W16x26 HAS SAME WEIGHT.

TRY W16x26

POST COMP LOAD

$w_u = (1.4)(10' \times 83 \text{ psf}) = 1162 \#/FT$

$1.2(10 \times 83) + 1.6(10')(40+15) = 1876$

↑ PARTITION

$M_u = 1.88(30)^2/8 = 212 \text{ k-FT}$

$b_{eff} \leq \begin{cases} \ell/8_R + \ell/8_L = 30'/4 = \underline{7.5'} \\ S_{R/2} + S_{L/2} = 10' \\ EOS = NA \end{cases}$

$a = \dfrac{\Sigma Q_n}{0.85 f'_c b_{eff}}$

ASSUME 1 STUD/FT $= 30/2 = 15$

$\Sigma Q_n = (15)(17.2^k) = 258^k$ ←

↑ TAB 3-21

$a = 258^k / 0.85(4)(7.5 \times 12) = 0.94''$

$Y_2 = 6.25 - 0.94/2 = 5.78$ ←

ENTER INTO TABLE 3-19

(SEE EX 3 FOR INTERP) $\phi M_n = 335$

[CHECK DEFLECTION PER EX3]

HAND CALC GAVE $I_{LB} = 883.0\ in^4$

OR

USE TABLE 3-20

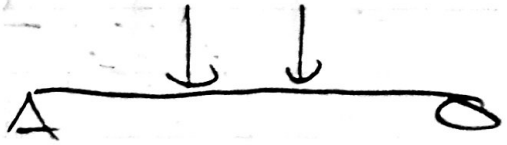
FOR $y_2 = 5.78"$ & $\Sigma Q_n = 288^k$

$$\left(\left[\frac{889 + 934}{2}\right] + \left[\frac{830 + 871}{2}\right]\right)/2$$

$I_{LB} = 880\ in^4$ ✓

CHECK GIRDER:

$P_{DL} =$



$1.4(68 \times 10 \times 30) = 28.6^k$

$1.2(68 \times 10 \times 30) + 1.6(20 \times 10 \times 30) = 34^k$

$M_u = Pa = 34^k \times 10' = 340\ k\text{-ft}$

BEAM BRACED AT 1/3 PTS $\Rightarrow L_b = 10'$

$C_b = 1.0$

USE TABLE 3-10

$\Rightarrow$ TRY W24x55 $\phi M_n = 408\ k\text{-ft}$

(W18x55 IS NEXT BUT SAME WEIGHT, SO W24x55 MORE EFFICIENT)

COMPOSITE STRENGTH:

$P_u = 1.2(83\,psf \times 10' \times 30') + 1.6(55\,psf \times 10' \times 30')$

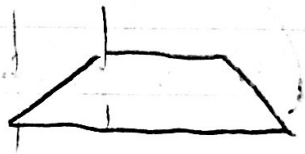
$P_u = 56^k$

$M_u = P \times a = 56^k \times 10' = 560\,k\text{-ft}$

TRY 1 STUD/FT

SINCE N IS FROM 0 → MMAX

$N = 30'/3 = 10$ STUDS



$\Sigma Q_n = (21.5^k)(10) = 215^k$

DECK PARALLEL
TAB 3-21

$b_{eff} \leq$ [$30/4 = 7.5'$ ← GOVERNS; $S_o = 30'$; EOS: NA]

$a = \frac{\Sigma Q_n}{0.85 f'_c b_{eff}} = \frac{215^k}{0.85(4)(90'')} = 0.70''$

$Y_2 = 6.25 - 0.70/2 = 6'' \Rightarrow$ TAB 3-19

$\Sigma Q_n = 250$

$\phi M_n = \frac{715 + 679}{2} = 712\,k\text{-ft}$

JK ✓

DEFL

$$\Delta = Pe^3/28EI \quad \text{(TABLE 3-23)}$$

$$\text{INITIAL DEFL} = \frac{(30'\times10'\times68)(30\times12)^3}{28E\,(I_b = 1140)}$$

$$= 1.02''$$

CAMBER 80% $\Rightarrow$ CAMBER $3/4''$

POST COMP DEFL.

$$I_{LB}\ (\text{TAB 3-20}) = \frac{(2290+2010)}{2} = 2150$$

$$\Delta_{LL} = \frac{(30'\times10'\times55)(30\times12)^3}{28E\,(I_{LB}=2150)} = 0.44''$$

$L/360 = 30'/360 = 1''$ ok ✓

ONLY REMAINING DL

$$\Delta_{POST} = \frac{(30'\times10'(55+15))(30\times12)^3}{28E\,(I_{LB}=2150)} = 0.56''$$

$$\Delta_{TOT} = 1.02' - 3/4'' + 0.56'' - 0.83''$$

$L/240 = 1.5''$ ok ✓

USE W21×55 <3/4>